Implementing Electronic Monitoring and Reporting in U.S. Fisheries

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Implementing Electronic Monitoring and Reporting in U.S. Fisheries

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Oyster Recovery Partnership

Incorporating Management Principles and Fishery Needs into Electronic Reporting Performance Standards
Electric Edge Systems Group  **THE MAKERS OF FACTS**
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Blue Crab Industry Design Team
Maryland Watermen

Provided Funding

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Developing E-Reporting Performance Standards

- Working Collaboratively with Industry
- Evaluating E-Reporting Performance Standards
- Verification Techniques Supported by E-Reporting
- Lessons Learned
- Next Steps
Why Do We Need a New Reporting System?
Maryland Blue Crab Fishery

- 60M dockside value
- Total Allowable Catch
- ~5,200 licensed crabbers
- Self-reporting fishery
- Gear types
  - Crab pots, trot lines, scrapes
- Scales of operation
- Units of sale and grade
**Work Collaboratively with Industry**

Blue Crab Design Team – Comprised of industry representatives

<table>
<thead>
<tr>
<th>Time Line</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Discussions</td>
<td>Optional management strategies, i.e. catch shares, other allocation strategies</td>
</tr>
<tr>
<td>Discovery</td>
<td>Current reporting is costly to manage and has limited use in decision-making because the accuracy is highly uncertain</td>
</tr>
<tr>
<td>Conclusion</td>
<td>No management strategy will be effective without improved reporting</td>
</tr>
</tbody>
</table>
What Did They Discover?

• Delay in Timeliness of Data
  – Monthly was not frequent enough
  – Reports get lost
  – Reports are not submitted
  – Data entry prolongs availability of data in a useful format

• Types of Errors and Bias
  – Intentional misreporting (latent effort)
  – Recall bias, filling out the report at the end of the month
  – Fields left blank/purposely left blank
  – Transcription errors
Why Do We Need a New Reporting System?

Why?- Industry and the Maryland DNR identified the inability to verify harvest information and slow delivery of usable information as the two contributing factors contributing to the lack of confidence and usability of the self-reported blue crab harvest.

E-Reporting System:

- Integrates business rules into the reporting process
- Facilitates automatic quality control (valid data ranges)
- Catches errors prior to entry
- Eliminates key punching and data entry (pulldowns)
- Facilitates effective harvest verification techniques (with hails)
What Does This Process Have to Do With Standards?
Management and Fishery Standards

Management

1. Total Allowable Catch
   - Biologically based
   - Target fishing rate

2. Ecosystem
   - Managed to achieve the biological needs of the fishery and ecosystem

3. Accountability
   - 100% of all fishery harvest will be accounted for and all fishers will be accountable for their harvest

4. Monitoring
   - Monitoring standards shall be established
Management and Fishery Standards

Fishery

1. Regulatory Flexibility
   - Ability to exploit the maximum amount of available harvest
   - Fishing operation flexibility (i.e., fish when they want to fish)

2. Provide Input
   - Development
   - Testing
   - Easy to use
   - Could be seamlessly integrated into daily fishing operations
   - Fishery owned technology (cell phones, smart phones, tablets and PC’s)
E-Reporting Performance Standards

Management

1. Daily
2. Accurate
3. Verifiable (harvest verification)

Fishery

1. Easy to use
2. Fishery owned technology (cell phones, smart phones, tablets and PC’s)
3. Facilitate flexible fishing operations and regulations (incentives)
Evaluating E-Reporting Performance Standards Pilot Project (2012-2014)

GOAL- Develop a E-Reporting system that watermen can use to report DAILY and evaluate the systems potential to improve the quality harvest information in the Maryland blue crab fishery.

OBJECTIVE 1- Determine if the blue crab industry had the capability to use an electronic harvest reporting system to report blue crab harvest DAILY;

OBJECTIVE 2- Determine if daily reporting can reduce the uncertainty and improve the quality of the reported harvest.
Pilot Project Evaluation

1. Watermen Participation and System Use
2. Harvest Verification Techniques
3. Electronic System Performance

<table>
<thead>
<tr>
<th>Evaluation Metrics</th>
<th>Qualitative</th>
<th>Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedback during project</td>
<td>Time required to report</td>
<td></td>
</tr>
<tr>
<td>Structured feedback meetings</td>
<td>Reported data outliers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Harvest verification</td>
<td></td>
</tr>
</tbody>
</table>
FACTSTM Daily Electronic Reporting Process

Three Steps to Report Daily
1. Trip Start Hail
2. Trip End Hail
3. Harvest Report

Reporting Platform Options
• Mobile Website
• Portal/Desktop Website
• Call Center
• Texting
## Watermen Participation and System Use

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Object Duration</strong></td>
<td>July to December</td>
<td>April to December</td>
<td>April to December</td>
</tr>
<tr>
<td><strong>Watermen Trained</strong></td>
<td>53</td>
<td>131</td>
<td>142</td>
</tr>
<tr>
<td><strong>Watermen Reporting</strong></td>
<td>49</td>
<td>113</td>
<td>98</td>
</tr>
<tr>
<td><strong>Trips Submitted</strong></td>
<td>1,879</td>
<td>4,992</td>
<td>3,603</td>
</tr>
<tr>
<td><strong>Gear Type</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crab Pots</td>
<td>24</td>
<td>47</td>
<td>42</td>
</tr>
<tr>
<td>Trot Line</td>
<td>29</td>
<td>77</td>
<td>53</td>
</tr>
<tr>
<td>Scrapes</td>
<td>5</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td><strong>Reporting Platform</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile Website</td>
<td>34</td>
<td>84</td>
<td>46</td>
</tr>
<tr>
<td>Texting</td>
<td>6</td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>Call Center</td>
<td>21</td>
<td>39</td>
<td>45</td>
</tr>
<tr>
<td>PC Website</td>
<td>0</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td><strong>Watermen Feedback</strong></td>
<td>44</td>
<td>64</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Watermen Participation and System Use

Number of Trips Reported for the Blue Crab Pilot Project by Month from 2012-2014

- July 2012 to December 2012: 1226 trips
- January 2013 to December 2013: 4355 trips
- January 2014 to December 2014: 1394 trips
Harvest Verification Standards

• Dockside Monitoring Standards
  – Ensure equal probability of monitoring all watermen in the Pilot Project
  – Ensure noticeable monitoring presence across multiple harvest offload locations daily
  – 10% of all trips monitored

• Dockside Monitoring Approach
  – Random approach based on prioritization
  – Daily spot checks scheduled using start hails
  – Intercepted at offload location
  – Entered verification into tablet at dockside
  – QA/QC of dockside monitors
Dockside Monitoring Frequency

Number of spot checks conducted on available trips

- 2012: 1226
- 2013: 4355
- 2014: 1394

Year
2013 Dockside Monitoring Results

- Watermen Total Female Crabs vs. Roving Monitor Total Female Crabs (bushels): $R^2 = 0.9625$
- Watermen Total Male Crabs vs. Roving Monitor Total Male Crabs (bushels): $R^2 = 0.9732$
- Watermen Total Peelers vs. Roving Monitor Total Peelers: $R^2 = 0.9937$
- Watermen Total Soft Crabs vs. Roving Monitor Total Soft Crabs: $R^2 = 0.9882$
2013 Dockside Monitoring Results
(Recovered Missing Harvest)
Flexible Standards
(Cellular Service Example)

• Some areas of the Bay still have poor cellular service

• Watermen found ways to report daily even in areas of poor cellular service

• Standards must be developed to account for instances when reporting can’t occur
Lessons Learned

- Buy-in from industry through transparent scoping process and assisted in the development of E-Reporting Performance Standards

- An electronic reporting system that relies on hails provided a useful and efficient mechanism to verify blue crab harvest.

- An electronic reporting system can help identify reporting errors and reporting behavior by users that can be used to design tools to further improve reporting accuracy.

- Standards must be flexible to account for certain limitations and future adjustments to requirements.
Next Steps

• Develop similar reporting capabilities for all MD DNR fisheries beginning with striped bass.

• Begin design and implementing system tools to improve reporting accuracy and compliance.

• Begin scoping integration of Federal and State reporting requirements using the MD Atlantic fleet as a model.

Questions?
The next few slides are extras
Types of Standards

Management and Fishery Standards

Reporting (Data) Standards

Technology (IT and Hardware) Standards

Database Standards
E-Reporting System Performance

System handled higher volumes with no incidence

Mobile technology supported higher volumes of trips (with exceptions)

System modifications (text messages) helped
Pilot Project (2012-2014)

• Develop a system that watermen could use to report DAILY fishing activity and harvest using cell phones to text information, tablet or personal computers to access a website, or through a call center.

• Provide blue crab watermen the opportunity to test the feasibility of using the system daily during their crabbing operations.

• Develop a program to verify fishing activity and harvest.
What Did Watermen Say? (2013 Feedback)

• Watermen provided valuable feedback on system performance and usability
  – Streamlining questions, look and feel of the reporting forms on the mobile website, text messages
• Electronic reporting was more convenient and probably more accurate than the monthly paper form
• Electronic reporting would enhance blue crab management
• 97% indicated they planned to continue to use the system
• 90% indicated they did not want to go back to paper reporting
• 80% agreed that trip start and trip end hailing was required to effectively monitor daily fishing activities
2013 Results (Harvest Verification)
Dockside Monitoring

104 dealer reported trips

- Bushel males
- Bushel females

\[ R^2 = 0.9627 \]
\[ R^2 = 0.9926 \]
Electronic System Performance

The system could identify outliers in reported data by out of range errors or comparisons against trends or roving monitor reports.

Errors were minimal.

<table>
<thead>
<tr>
<th>Outlier Type</th>
<th># of Trips</th>
<th>% of Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crew Count</td>
<td>15</td>
<td>0.33</td>
</tr>
<tr>
<td>Crabbing Gear</td>
<td>2</td>
<td>0.04</td>
</tr>
<tr>
<td>Hours Crabbed</td>
<td>217</td>
<td>4.79</td>
</tr>
<tr>
<td>Area Crabbed</td>
<td>8</td>
<td>0.18</td>
</tr>
<tr>
<td>Bushels of Male Hard Crabs</td>
<td>9</td>
<td>0.2</td>
</tr>
<tr>
<td>Bushels of Female Hard Crabs</td>
<td>57</td>
<td>1.26</td>
</tr>
<tr>
<td>Number of Peelers</td>
<td>136</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>444</td>
<td>9.8</td>
</tr>
</tbody>
</table>
Questions?

Thanks!
Blue Crab Fishery Management

- 60M dockside value
- Total Allowable Bay-wide Catch (TAC)
- Bushel limits for mature females and size limits for male crabs
- Self-reporting fishery (monthly)
  - Activity Level Details
  - Harvest Level Details
  - Market Destination
# E-Reporting System Performance (Regulatory Flexibility)

## Waterman use and opinions of flexible day off

<table>
<thead>
<tr>
<th># of times watermen used flexible day off</th>
<th>% Watermen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>39%</td>
</tr>
<tr>
<td>Once or twice</td>
<td>19%</td>
</tr>
<tr>
<td>A few times</td>
<td>27%</td>
</tr>
<tr>
<td>A lot</td>
<td>16%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Decision to participate based on availability to choose a flexible day off</th>
<th>% Watermen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>44%</td>
</tr>
<tr>
<td>No</td>
<td>56%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flexible day off provided flexibility with weekly crabbing schedule</th>
<th>% Watermen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>66%</td>
</tr>
<tr>
<td>No</td>
<td>34%</td>
</tr>
</tbody>
</table>
Hailing Effect on Verification Success

2012

Trip End Hail Group
- Successful: 74%
- Not Successful: 26%

Trip Start/End Hail Group
- Successful: 89%
- Not Successful: 11%

2013

Percent of Successful and Unsuccessful Spot Checks Overall

- Successful Monitoring: 79.7%
- Unsuccessful - Could not find vessel: 0.9%
- Unsuccessful - Offload did not occur when scheduled: 17.8%
- Unsuccessful - Unable to reach offload location: 1.5%
Maryland Blue Crab Fishery

Figure 7. Maryland, Virginia and Potomac River commercial blue crab harvest in millions of pounds, all market categories, 1990-2014.

Source: Chesapeake Bay Blue Crab Advisory Committee 2015 Annual Report